U.S. Department of the Interior • U.S. Geological Survey

# MINERAL INDUSTRY SURVEYS

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## VANADIUM IN DECEMBER 1996

The total reported consumption of vanadium in December increased by about 8% from consumption in November, according to the U.S. Geological Survey. A decrease of about 14% in the tool steel end use category was more than offset by increases ranging from 3% for the full alloy end use category to 21% for the carbon steel end use category. Superalloys, a relatively small consuming sector, increased by 43%. Total consumption in December was 397 metric tons, about 6% more than consumption in December 1995.

### Update: Defense Logistics Agency Awards $V_2O_5$

Fort Belvoir, VA—The Defense National Stockpile Center on January 28, 1997, awarded vanadium pentoxide under invitation for Bids, DLA-VANADIUM-001. Awards were made to:

| Firm | Quantity (pounds) | Unit price | Value |
|---|---|---|---|
| Shieldalloy Met. Corp. Newfield, NJ | 63,952.0 | $3.40 | $217,436.80 |
| Considar, Inc. New York, NY | 64,131.2 | $3.39 | $217,404.77 |
| | 63,840.0 | $3.35 | $213,864.00 |
| Total | 191,923.2 | | $648,705.57 |

This sale of material exhausts the quantity of vanadium pentoxide available for sale during Fiscal Year 1997 (October 1, 1996-September 30, 1997). Meanwhile, the open market price for both vanadium pentoxide and ferrovanadium continued strong in December, with pentoxide prices in the $3.30-$3.40 per pound range, and expected to increase to above $3.50 by the end of February.

### New Vanadium-Chromium-Titanium Alloy Developed

A vanadium-chromium-titanium alloy (V-4Cr-4Ti) reportedly has been developed by Wah Chang (formerly Teledyne Wah Chang), Albany, OR, and General Atomics, San Diego, CA. The alloy was produced by Wah Chang for fabrication of a plasma control component (radiative divertor) in a General Atomics tokamac fusion device. A high purity version of the alloy reportedly will possess unique properties that allow long-term use as a low-activation structural material in the high-temperature neutron environment of an advanced fusion system.[1]

[1]Advanced Materials & Processes, Jan., 1997, p. 7.

Prepared by the Metals Section and the Data Collection and Coordination Section, February 18, 1997.

TABLE 1
U.S. CONSUMPTION AND CONSUMER STOCKS OF VANADIUM, BY FORM, IN 1996 1/

(Kilograms, contained vanadium)

| | November | | December | |
|---|---|---|---|---|
| | Consumption | Stocks | Consumption | Stocks |
| Ferrovanadium 2/ | 322,000 r/ | 334,000 r/ | 353,000 | 310,000 |
| Oxide | 1,120 | 6,610 | 1,120 | 6,610 |
| Vanadium-aluminum alloy | W | 10,200 r/ | W | 10,200 |
| Vanadium chemicals 3/ | W | W | W | W |
| Other 4/ | 42,900 | 5,540 | 42,900 | 5,460 |
| Total | 366,000 r/ | 357,000 r/ | 397,000 | 332,000 |

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes other vanadium-iron-carbon alloys as well as vanadium oxides added directly to steel.

3/ Includes vanadates, chlorides and other specialty chemicals.

4/ Includes other vanadium alloys, vanadium metal, and items indicated by symbol "W."

TABLE 2
U.S. CONSUMPTION OF VANADIUM, BY END USE 1/

(Kilograms, contained vanadium)

| | | 1996 | | |
|---|---|---|---|---|
| | 1995 | November | December | Year to date p/ 2/ |
| Steel: | | | | |
| Carbon | 1,870,000 | 123,000 | 149,000 | 1,630,000 |
| Stainless and heat-resisting | 31,800 | 1,610 | 1,610 | 21,600 |
| Full alloy | 833,000 | 73,600 r/ | 76,100 | 1,050,000 |
| High-strength low-alloy | 1,070,000 | 79,500 r/ | 85,900 | 933,000 |
| Tool | 443,000 | 42,900 | 37,000 | 409,000 |
| Unspecified | W | -- | -- | -- |
| Total steel | 4,240,000 | 320,000 r/ | 350,000 | 4,050,000 |
| Cast irons | 39,600 | W | W | W |
| Superalloys | 20,400 | 1,220 | 1,740 | 17,500 |
| Alloys (excluding steels and superalloys): | | | | |
| Cutting and wear-resistant materials | 271 | 20 | 20 | 245 |
| Welding and alloy hard-facing rods and materials | 3,440 | W | W | W |
| Nonferrous alloys | W | W | W | W |
| Other alloys 3/ | 307,000 | W | W | W |
| Chemical and ceramic uses: | | | | |
| Catalysts | W | W | W | W |
| Other 4/ | W | W | W | W |
| Miscellaneous and unspecified | 20,200 | 44,100 | 45,200 | 439,000 |
| Total consumption | 4,640,000 | 366,000 r/ | 397,000 | 4,500,000 |

p/ Preliminary. r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Miscellaneous and unspecified."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ May include revisions to previous months' data.

3/ Includes magnetic alloys.

4/ Includes pigments.

TABLE 3
U. S. EXPORTS OF ALUMINUM-VANADIUM MASTER ALLOY, FERROVANADIUM, OXIDES
AND HYDROXIDES OF VANADIUM, AND VANADIUM METAL IN NOVEMBER 1996 1/

(Kilograms, vanadium content unless otherwise specified)

| Material and country | Quantity | Value | Year to date p/ Quantity | Year to date p/ Value |
|---|---|---|---|---|
| Aluminum-vanadium master alloy: 2/ | | | | |
| Argentina | -- | -- | 1,080 | $14,000 |
| Australia | -- | -- | 499 | 6,380 |
| Austria | 10,400 | $135,000 | 13,900 | 172,000 |
| Barbados | -- | -- | 18,900 | 237,000 |
| Canada | 2,730 | 35,500 | 94,300 | 1,160,000 |
| Chile | -- | -- | 770 | 10,000 |
| France | -- | -- | 2,980 | 38,800 |
| Germany | -- | -- | 4,420 | 65,400 |
| Ireland | -- | -- | 782 | 14,600 |
| Japan | -- | -- | 20,100 | 313,000 |
| Korea, Republic of | -- | -- | 3,270 | 42,500 |
| Malaysia | -- | -- | 897 | 11,700 |
| Mexico | 2,610 | 33,900 | 32,900 | 434,000 |
| Philippines | -- | -- | 409 | 5,310 |
| Russia | -- | -- | 15,200 | 274,000 |
| Suriname | -- | -- | 139 | 6,460 |
| Switzerland | -- | -- | 571 | 7,420 |
| Taiwan | 4,110 | 47,100 | 4,110 | 47,100 |
| United Kingdom | -- | -- | 68,500 | 1,200,000 |
| Venezuela | -- | -- | 3,810 | 49,600 |
| Total | 19,800 | 251,000 | 288,000 | 4,100,000 |
| Ferrovanadium: | | | | |
| Australia | -- | -- | 546 | 6,830 |
| Canada | 37,000 | 675,000 | 286,000 | 5,180,000 |
| Guatemala | 114 | 3,760 | 114 | 3,760 |
| Mexico | 18,600 | 454,000 | 133,000 | 2,700,000 |
| Venezuela | -- | -- | 2,300 | 76,800 |
| Total | 55,800 | 1,130,000 | 422,000 | 7,970,000 |
| Vanadium pentoxide (anhydride): 3/ | | | | |
| Austria | -- | -- | 4,340 | 41,200 |
| Belgium | -- | -- | 7,850 | 103,000 |
| Chile | -- | -- | 18 | 2,680 |
| France | 8,070 | 104,000 | 12,100 | 132,000 |
| Italy | -- | -- | 90,500 | 783,000 |
| Japan | -- | -- | 13,800 | 126,000 |
| Kuwait | -- | -- | 4,970 | 34,300 |
| Mexico | -- | -- | 4,700 | 46,500 |
| Pakistan | -- | -- | 6,040 | 83,600 |
| Peru | -- | -- | 2,260 | 10,400 |
| Taiwan | -- | -- | 632 | 6,000 |
| United Kingdom | 3,440 | 25,000 | 43,500 | 356,000 |
| Total | 11,500 | 129,000 | 191,000 | 1,730,000 |
| Other oxides and hydroxides of vanadium: | | | | |
| Argentina | -- | -- | 360 | 3,200 |
| Australia | -- | -- | 675 | 6,000 |
| Canada | 42,400 | 301,000 | 281,000 | 2,030,000 |
| France | -- | -- | 15,200 | 128,000 |
| Germany | -- | -- | 6,290 | 67,300 |
| Italy | -- | -- | 17,200 | 137,000 |
| Japan | -- | -- | 100 | 3,610 |
| Russia | -- | -- | 12,300 | 110,000 |
| South Africa | -- | -- | 61,100 | 474,000 |
| Spain | -- | -- | 2,210,000 | 9,030,000 |
| Switzerland | -- | -- | 13,800 | 74,100 |
| Total | 42,400 | 301,000 | 2,620,000 | 12,100,000 |
| Vanadium metal, including waste and scrap: 2/ | | | | |
| Australia | 1 | 12,500 | 2,320 | 105,000 |
| Austria | -- | -- | 6,060 | 236,000 |
| Canada | -- | -- | 1,750 | 46,700 |
| France | -- | -- | 8,660 | 344,000 |
| Germany | -- | -- | 636 | 18,100 |
| Taiwan | -- | -- | 131 | 11,900 |
| United Kingdom | -- | -- | 84,800 | 578,000 |
| Total | 1 | 12,500 | 104,000 | 1,340,000 |

p/ Preliminary.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Gross weight.
3/ May include catalysts containing vanadium pentoxide.

Source: Bureau of the Census.

TABLE 4
U.S. IMPORTS FOR CONSUMPTION OF ALUMINUM-VANADIUM MASTER ALLOY,
FERROVANADIUM, OXIDES AND HYDROXIDES OF VANADIUM, AND VANADIUM METAL IN NOVEMBER 1996 1/

(Kilograms, vanadium content unless otherwise specified)

| Material and country | Quantity | Value | Year to date p/ 2/ Quantity | Year to date p/ 2/ Value |
|---|---|---|---|---|
| Aluminum-vanadium master alloy: 3/ | | | | |
| Germany | -- | -- | 1,610 | $16,500 |
| Russia | -- | -- | 4,200 | 136,000 |
| Ferrovanadium: | | | | |
| Austria | -- | -- | 45,100 | 718,000 |
| Belgium | -- | -- | 62,700 | 947,000 |
| Canada | 76,000 | $1,200,000 | 611,000 | 9,500,000 |
| China | 26,100 | 366,000 | 242,000 | 3,390,000 |
| Czech Republic | 36,600 | 525,000 | 441,000 | 6,170,000 |
| Germany | -- | -- | 2,690 | 32,300 |
| Russia | -- | -- | 70,400 | 1,440,000 |
| South Africa | 27,400 | 417,000 | 216,000 | 3,260,000 |
| Tajikistan | -- | -- | 40,500 | 626,000 |
| Total | 166,000 | 2,510,000 | 1,730,000 | 26,100,000 |
| Vanadium pentoxide (anhydride): 4/ | | | | |
| China | -- | -- | 40,800 | 329,000 |
| France | -- | -- | 10,200 | 252,000 |
| Germany | -- | -- | 517 | 21,700 |
| Hong Kong | -- | -- | 198 | 18,700 |
| South Africa | 74,300 | 921,000 | 405,000 | 5,040,000 |
| United Kingdom | 1 5/ | 1,610 5/ | 5 | 28,800 |
| Total | 74,300 | 923,000 | 457,000 | 5,680,000 |
| Other oxides and hydroxides of vanadium: | | | | |
| France | -- | -- | 304 | 48,600 |
| Germany | 4 | 1,870 | 5 | 4,490 |
| United Kingdom | 4,490 | 76,000 | 10,500 | 152,000 |
| Total | 4,490 | 77,900 | 10,800 | 205,000 |
| Vanadium metal, including waste and scrap: 3/ | | | | |
| France | -- | -- | 90 | 8,500 |
| Germany | 1,680 | 17,700 | 33,900 | 585,000 |
| Russia | 779 | 10,500 | 1,930 | 103,000 |
| United Kingdom | -- | -- | 5 | 15,900 |
| Total | 2,460 | 28,200 | 36,000 | 712,000 |

p/ Preliminary.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ May include revisions to previous months' data.
3/ Gross weight.
4/ May include catalysts containing vanadium pentoxide.
5/ All or part of these data have been referred to the Bureau of the Census for verification.

Source: Bureau of the Census.

TABLE 5
U.S. IMPORTS FOR CONSUMPTION OF VANADIUM-BEARING
ASH, SLAG AND RESIDUES IN NOVEMBER 1996 1/

(Kilograms, vanadium pentoxide content)

| Material and country | Quantity | Value | Year to date p/ Quantity | Year to date p/ Value |
|---|---|---|---|---|
| Ash and residues: | | | | |
| Canada | 32,400 | $97,800 | 221,000 | $641,000 |
| Dominican Republic | 23,100 | 16,600 | 23,100 | 16,600 |
| Germany | -- | -- | 5,150 | 3,960 |
| Mexico | 163,000 | 452,000 | 718,000 | 2,390,000 |
| Netherlands | 5,280 | 4,380 | 13,000 | 7,050 |
| Netherlands Antilles | -- | -- | 87,900 | 168,000 |
| Portugal | -- | -- | 7,130 | 6,470 |
| United Kingdom | -- | -- | 14,800 | 3,260 |
| Total | 224,000 | 571,000 | 1,090,000 | 3,230,000 |
| Ash and residues (not from the manufacture of iron and steel): | | | | |
| Canada | -- | -- | 1,350,000 | 307,000 |
| Slag, from the manufacture of iron and steel: | | | | |
| South Africa | 288,000 | 1,110,000 | 1,170,000 | 4,500,000 |
| Other residues: (Not advanced in value) | -- | -- | -- | -- |

p/ Preliminary.
1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF MISCELLANEOUS
VANADIUM CHEMICALS IN NOVEMBER 1996 1/

(Kilograms, vanadium content)

| Material and country | Quantity | Value | Year to date p/ 2/ Quantity | Year to date p/ 2/ Value |
|---|---|---|---|---|
| Sulfates: | | | | |
| India | -- | -- | 25 | $14,900 |
| Vanadates: | | | | |
| Germany | 12 | $1,940 | 3,450 | 76,500 |
| South Africa | -- | -- | 57,300 | 398,000 |
| Switzerland | 1 | 2,380 | 100 | 3,650 |
| Total | 13 | 4,320 | 60,900 | 478,000 |
| Hydrides and nitrides: | | | | |
| South Africa | -- | -- | 255,000 | 4,630,000 |

p/ Preliminary.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ May include revisions to previous months' data.

Source: Bureau of the Census.